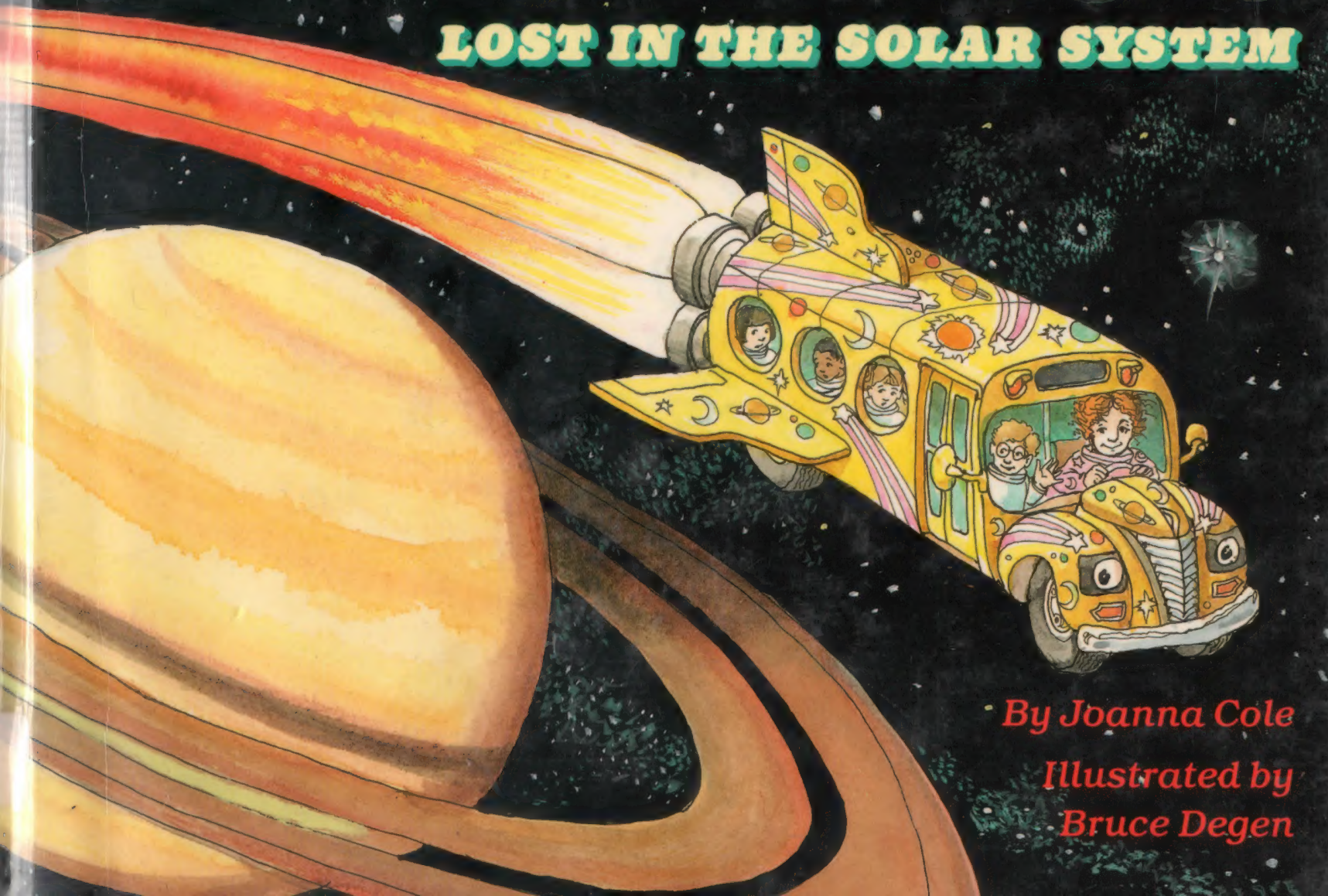
The Magic School Bus

LOST IN THE SOLAR SYSTEM



By Joanna Cole

Illustrated by Bruce Degen

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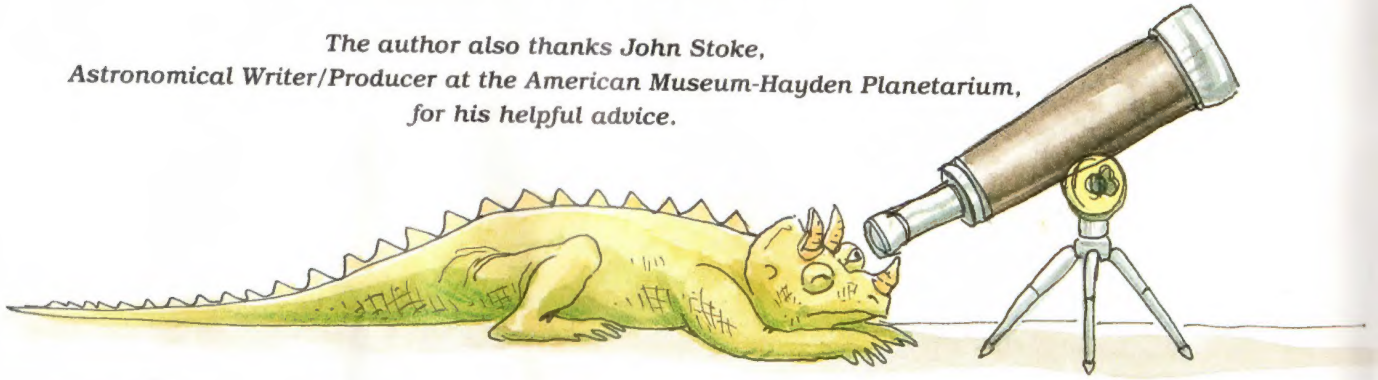

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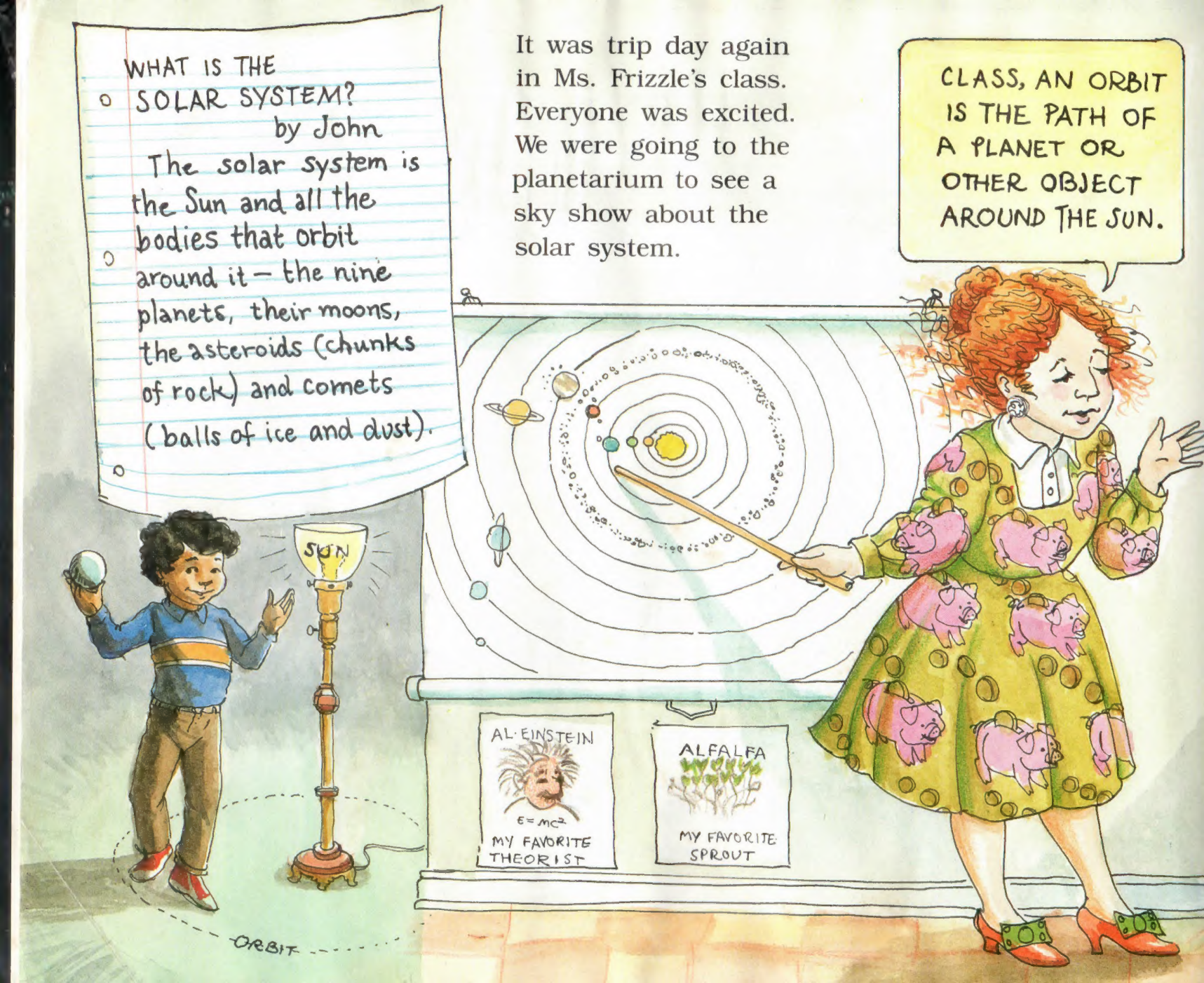
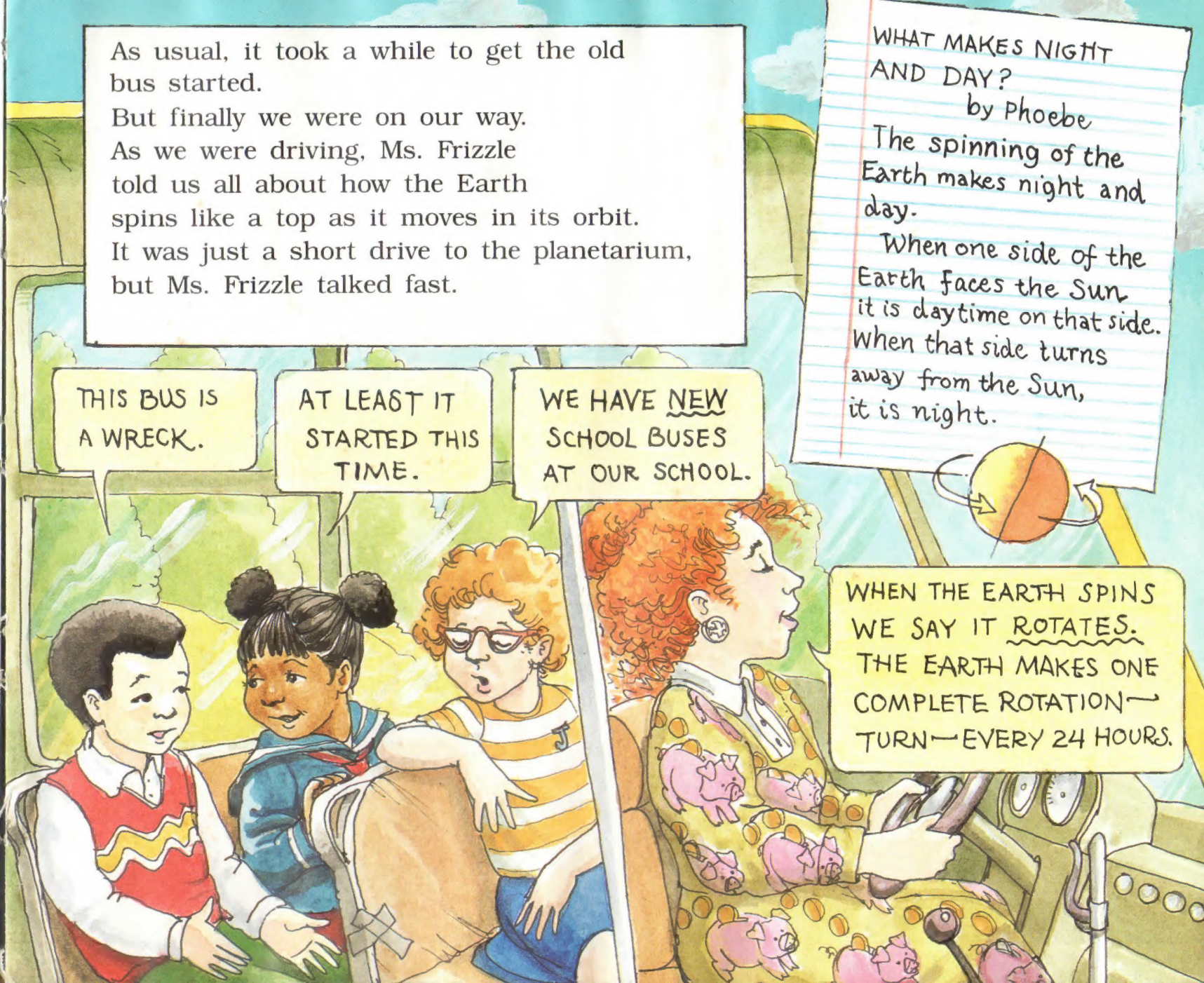
To Virginia and Bob McBride—J.C.

For Chris, queen of the
Biscadorian Mother ship—B.D.

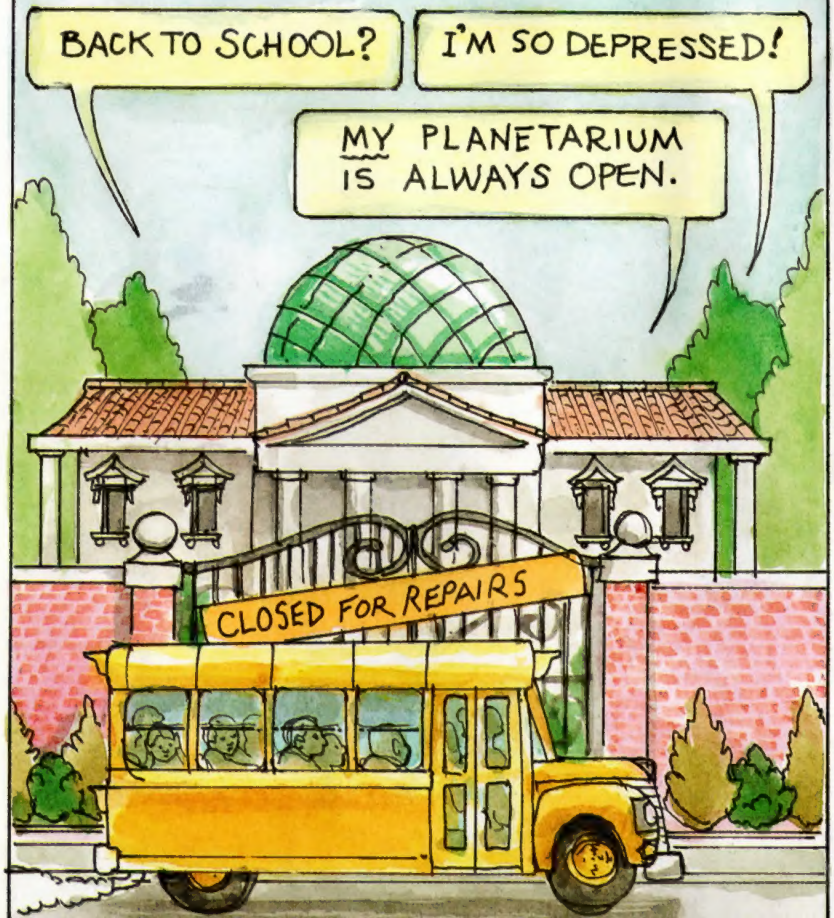

WHAT IS THE SOLAR SYSTEM?
by John
The solar system is the Sun and all the bodies that orbit around it – the nine planets, their moons, the asteroids (chunks of rock) and comets (balls of ice and dust).
It was trip day again in Ms. Frizzle's class. Everyone was excited. We were going to the planetarium to see a sky show about the solar system.
CLASS, AN ORBIT IS THE PATH OF A PLANET OR OTHER OBJECT AROUND THE SUN.
SUN
ORBIT
AL·EINSTEIN
E=mc²
MY FAVORITE THEORIST
ALFALFA
MY FAVORITE SPROUT

Arnold's cousin Janet was
visiting our class for the day.
"I know all of you
will be nice to our guest," said the Friz.

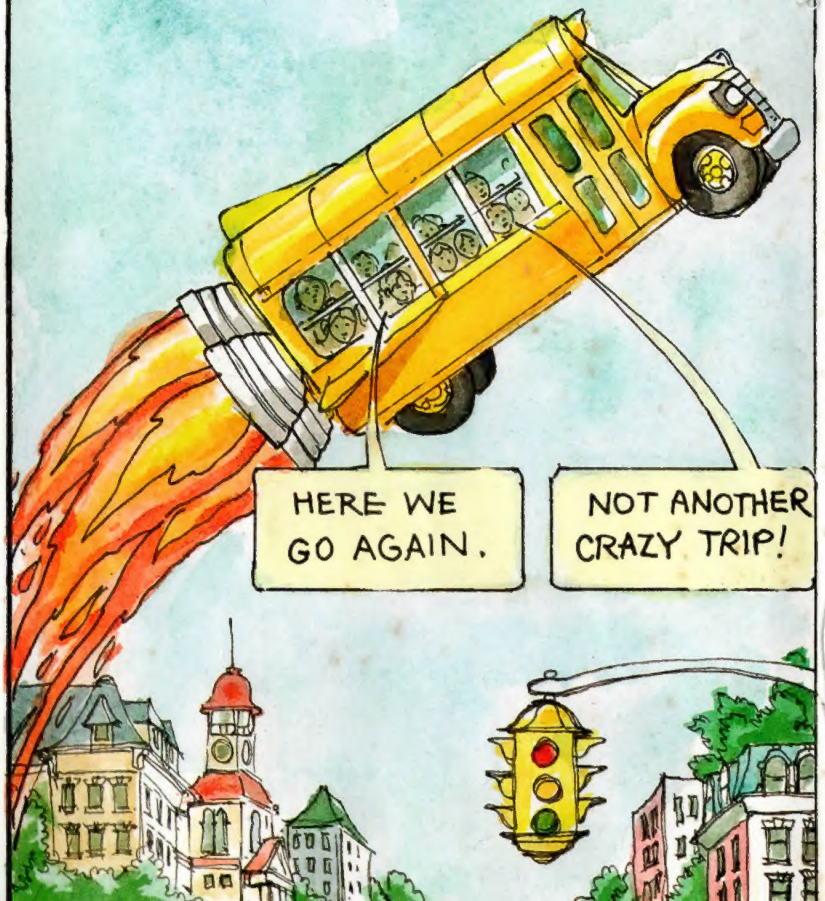
We tried to be nice to Janet.
We really did.
As we got on the school bus,
we told her that Ms. Frizzle
is the weirdest teacher in school.
But Janet wasn't interested.
She wanted to tell us about herself.

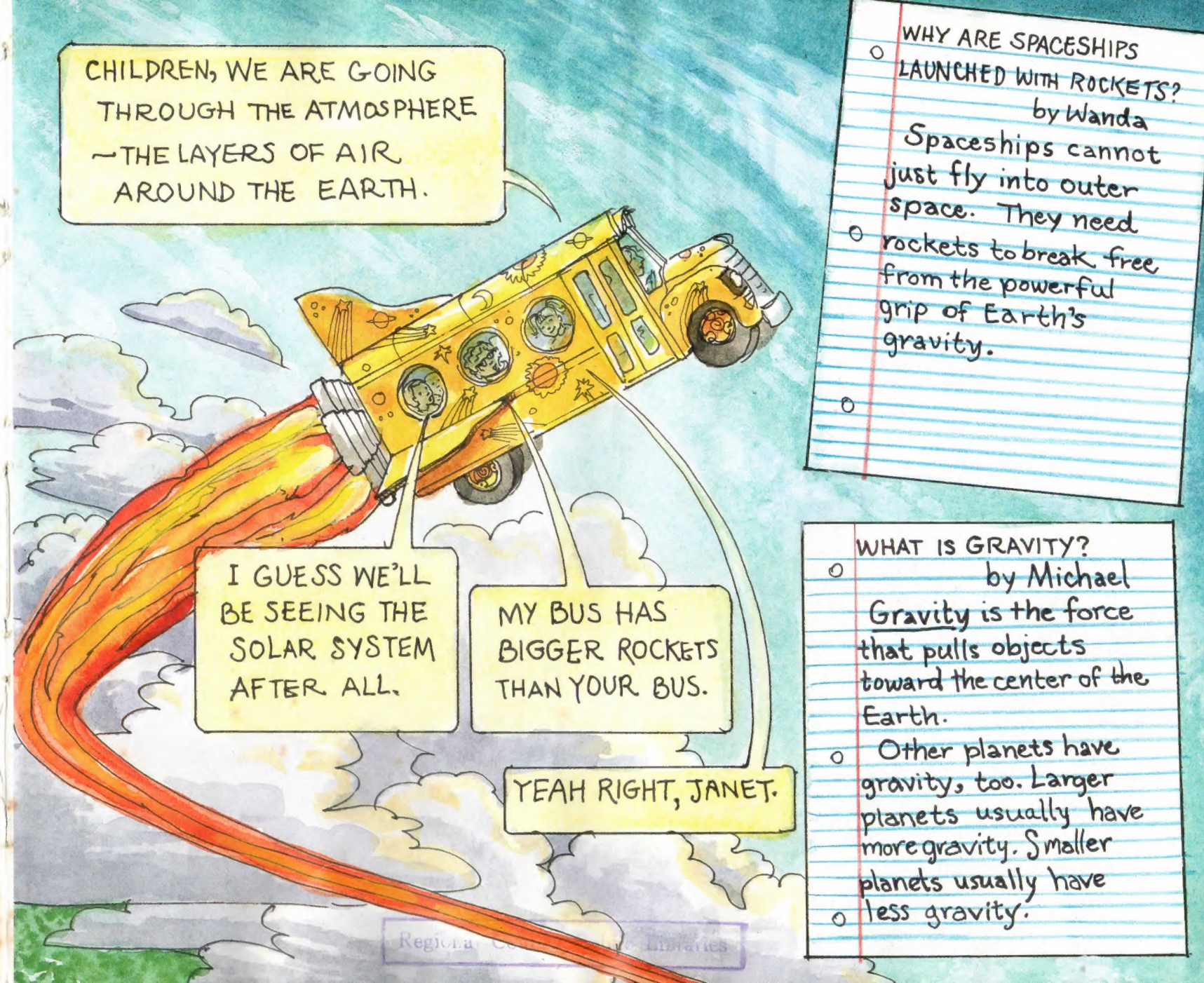

As usual, it took a while to get the old bus started.
But finally we were on our way.
As we were driving, Ms. Frizzle told us all about how the Earth spins like a top as it moves in its orbit.
It was just a short drive to the planetarium, but Ms. Frizzle talked fast.
WHAT MAKES NIGHT AND DAY?
by Phoebe
The spinning of the Earth makes night and day.
When one side of the Earth faces the Sun, it is daytime on that side. When that side turns away from the Sun, it is night.
THIS BUS IS A WRECK.
AT LEAST IT STARTED THIS TIME.
WE HAVE NEW SCHOOL BUSES AT OUR SCHOOL.
WHEN THE EARTH SPINS WE SAY IT ROTATES. THE EARTH MAKES ONE COMPLETE ROTATION—TURN—EVERY 24 HOURS.

When we got to the planetarium,
it was closed for repairs.
"Class, this means we'll
have to return to school,"
said the Friz.
We were so disappointed!



On the way back,
as we were waiting at a red light,
something amazing happened.
The bus started tilting back,
and we heard the roar of rockets.
"Oh, dear," said Ms. Frizzle.
"We seem to be blasting off!"




CHILDREN, WE ARE GOING THROUGH THE ATMOSPHERE —THE LAYERS OF AIR AROUND THE EARTH.
I GUESS WE'LL BE SEEING THE SOLAR SYSTEM AFTER ALL.
MY BUS HAS BIGGER ROCKETS THAN YOUR BUS.
YEAH RIGHT, JANET.
WHY ARE SPACESHIPS LAUNCHED WITH ROCKETS?
by Wanda
Spaceships cannot just fly into outer space. They need rockets to break free from the powerful grip of Earth's gravity.
WHAT IS GRAVITY?
by Michael
Gravity is the force that pulls objects toward the center of the Earth.
Other planets have gravity, too. Larger planets usually have more gravity. Smaller planets usually have less gravity.


WHY DO PEOPLE FEEL WEIGHTLESS IN SPACE?
by Phil
Gravity gives objects weight. Without a large mass nearby — such as a planet — there is no gravity to pull objects down, so they do not have weight.
When the roar of the rockets stopped, we looked around.
Everything had changed.
The bus had turned into a spaceship.
We were all dressed in space suits, and we were lighter than feathers.
We floated above our seats!
UP
I'M FLYING!
I'M FLYING HIGHER THAN YOU ARE!
LOOK! IT'S A U.F.B.
A WHAT?
AN UNIDENTIFIED FLYING BANANA.
UP
UP

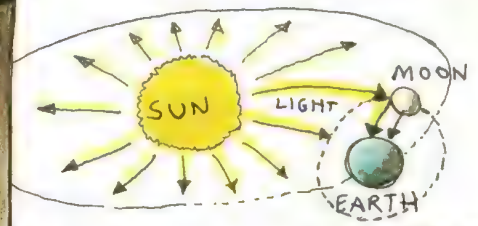

Far behind, in the black sky, we saw the planet Earth getting smaller and smaller. We were traveling in space! We had become astronauts!
LOOK HOW SMALL THE EARTH SEEMS FROM HERE!
CLASS, NOTICE EARTH'S BLUE OCEANS, WHITE CLOUDS AND BROWN LAND.
IT'S BEAUTIFUL!
I THINK I HAVE TO GO TO THE BATHROOM.


The Friz said our first stop
would be the Moon.
We got off the bus and looked around.
There was no air, no water,
no sign of life.
All we saw were dust and rock
and lots and lots of craters.
Ms. Frizzle said the craters were
formed billions of years ago
when the Moon was hit by meteorites.
Meteorites are falling chunks
of rock and metal.
WE ARE SO LIGHT ON THE MOON!
THAT'S BECAUSE THE MOON HAS LESS GRAVITY THAN THE EARTH.
YOUR WEIGHT AND FATE ON THE MOON
lbs.
85
Earth Weight
lbs.
14
Moon Weight
You will travel to far off places.

It was fun on the Moon.
We wanted to play,
but Ms. Frizzle said it was time to go.
So we got back on the bus.
"We'll start with the Sun,
the center of the solar system,"
said the Friz, and we blasted off.

WHAT MAKES THE MOON SHINE?
by Rachel

The Moon does not make any light of its own. The moonlight we see from Earth is really light from the sun. It hits the Moon and bounces off, the way light is reflected from a mirror.



THE MOON'S ORBIT
by Amanda Jane

The Moon travels in orbit around the Earth, just as the Earth travels around the Sun.

THE SUN IS A STAR
by Carmen
Our Sun is an average star like the ones we see in the night sky.

WHICH STAR DO WE SEE ONLY IN THE DAYTIME?

THAT'S EASY: THE SUN.

HOW BIG IS THE SUN?
by Gregory
Our sun measures more than a million kilometers across. More than one million Earths could fit inside it!

We zoomed toward the Sun, the biggest, brightest, and hottest object in the solar system. Jets of super-hot gases shot out at us from the surface. Thank goodness Ms. Frizzle didn't get *too* close!

YOU SHOULD NEVER LOOK DIRECTLY AT THE SUN, CHILDREN. IT CAN DAMAGE YOUR EYES!

YOU SHOULD NEVER DRIVE A BUS DIRECTLY INTO THE SUN, EITHER!

HOT!

SOLAR FLARES are giant storms on the Sun's surface.

She steered around to the other side and pulled away.
"We'll be seeing all the planets in order, class," explained Frizzie. "Mercury is the first planet, the closest to the Sun."

MY SCHOOL IS HEATED WITH SOLAR ENERGY.

I HAVE A SUN DECK.

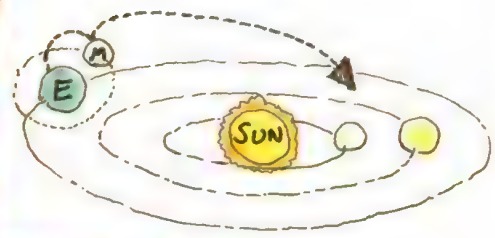
I HAVE TEN PAIRS OF SUNGLASSES.

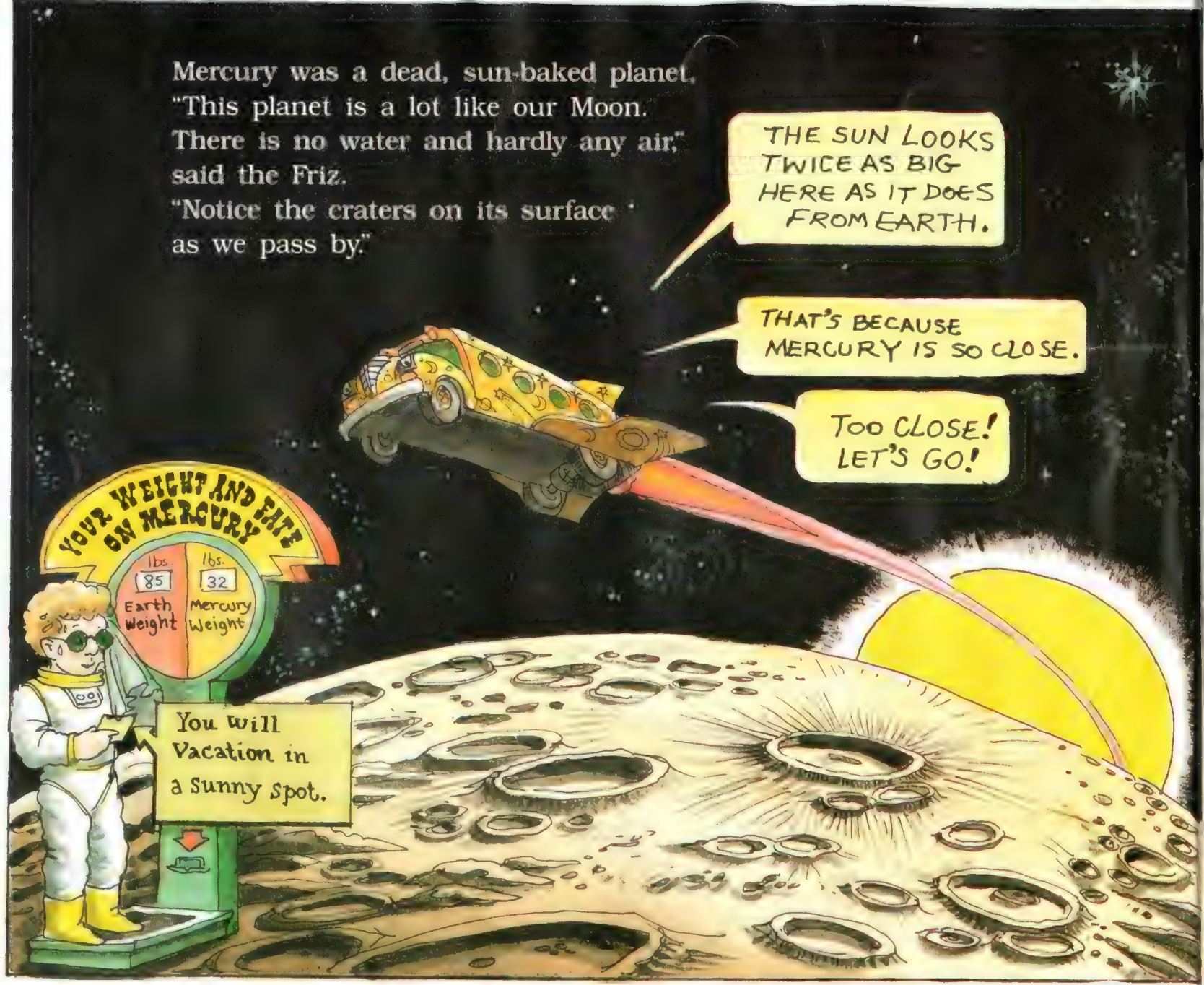
GIVE US A BREAK, JANET.

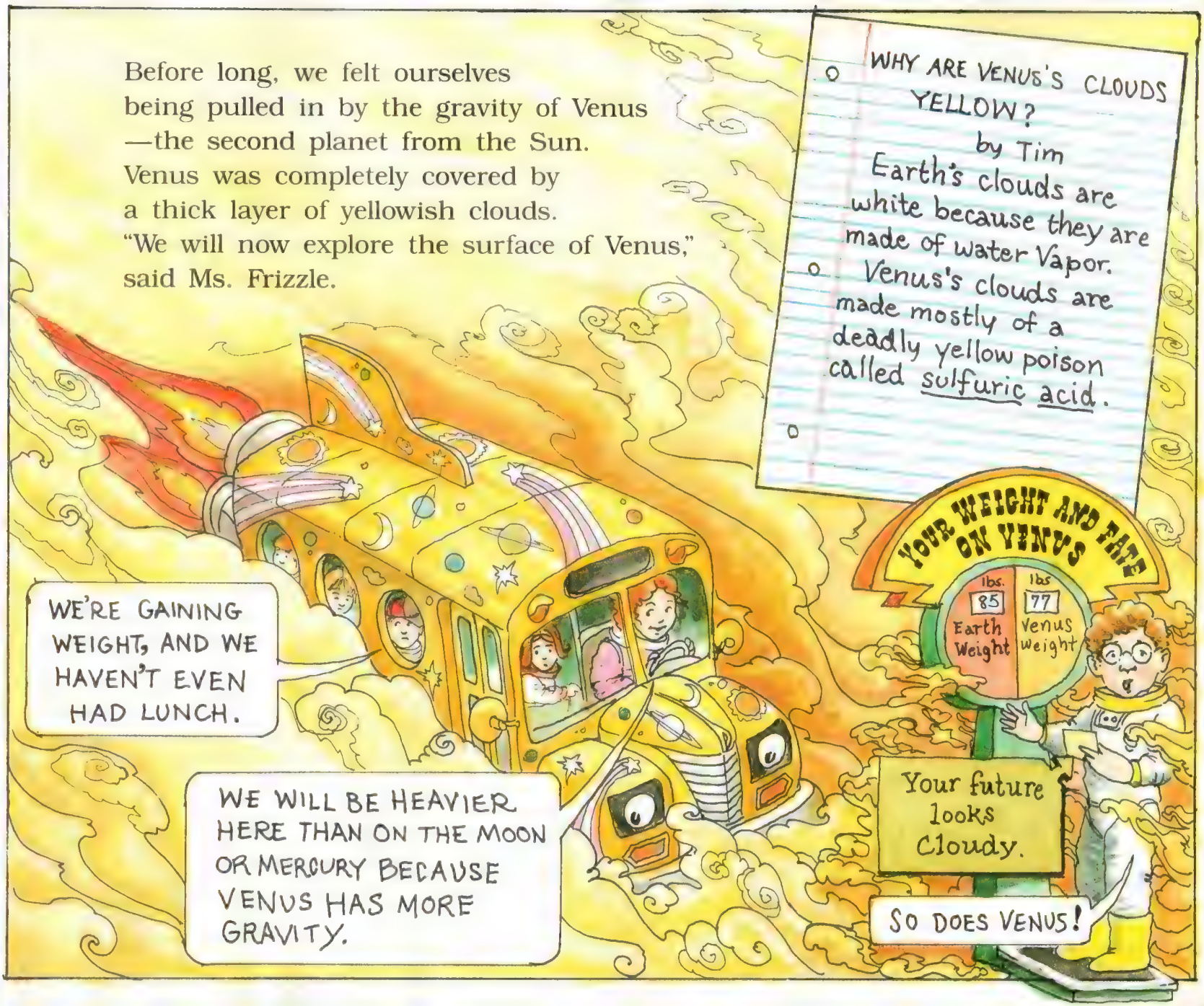
SUNSPOTS are [illegible]s that are [illegible]oler than the rest of the Sun.

HOW HOT IS THE SUN?
by Florrie
At the center of the sun the temperature is about 15 million degrees Centigrade! The sun is so hot it heats planets that are millions of kilometers away.

Our Path So Far



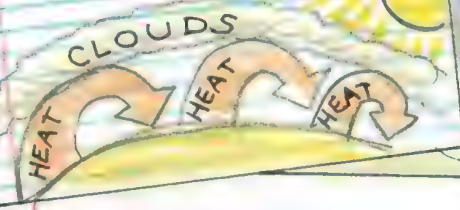

Mercury was a dead, sun-baked planet.
"This planet is a lot like our Moon.
There is no water and hardly any air,"
said the Friz.
"Notice the craters on its surface
as we pass by."
THE SUN LOOKS TWICE AS BIG HERE AS IT DOES FROM EARTH.
THAT'S BECAUSE MERCURY IS SO CLOSE.
TOO CLOSE! LET'S GO!
YOUR WEIGHT AND FATE ON MERCURY
lbs.
85
Earth Weight
lbs.
32
Mercury Weight
You will Vacation in a Sunny Spot.


Before long, we felt ourselves being pulled in by the gravity of Venus —the second planet from the Sun. Venus was completely covered by a thick layer of yellowish clouds. "We will now explore the surface of Venus," said Ms. Frizzle.
WHY ARE VENUS'S CLOUDS YELLOW?
by Tim
Earth's clouds are white because they are made of water vapor.
Venus's clouds are made mostly of a deadly yellow poison called sulfuric acid.
YOUR WEIGHT AND FATE ON VENUS
lbs. 85 Earth Weight
lbs 77 Venus weight
Your future looks Cloudy.
WE'RE GAINING WEIGHT, AND WE HAVEN'T EVEN HAD LUNCH.
WE WILL BE HEAVIER HERE THAN ON THE MOON OR MERCURY BECAUSE VENUS HAS MORE GRAVITY.
SO DOES VENUS!

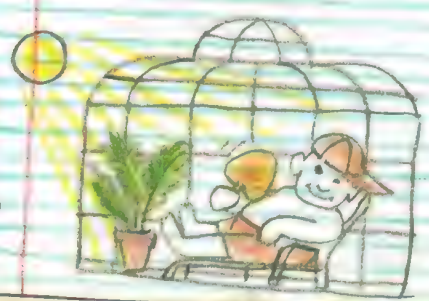
Below the clouds, Venus was as dry as a desert.
The ground was covered with rocks.
And it was HOT!
It was about 400 degrees Centigrade!
That's *much* hotter than an oven baking cookies!

WHY IS IT SO HOT ON VENUS?
by Ralph

Venus's atmosphere has a lot of carbon dioxide gas in it. Carbon dioxide acts like a blanket to hold heat in.



When heat is trapped like this by a planet's atmosphere, it is called the "greenhouse effect."



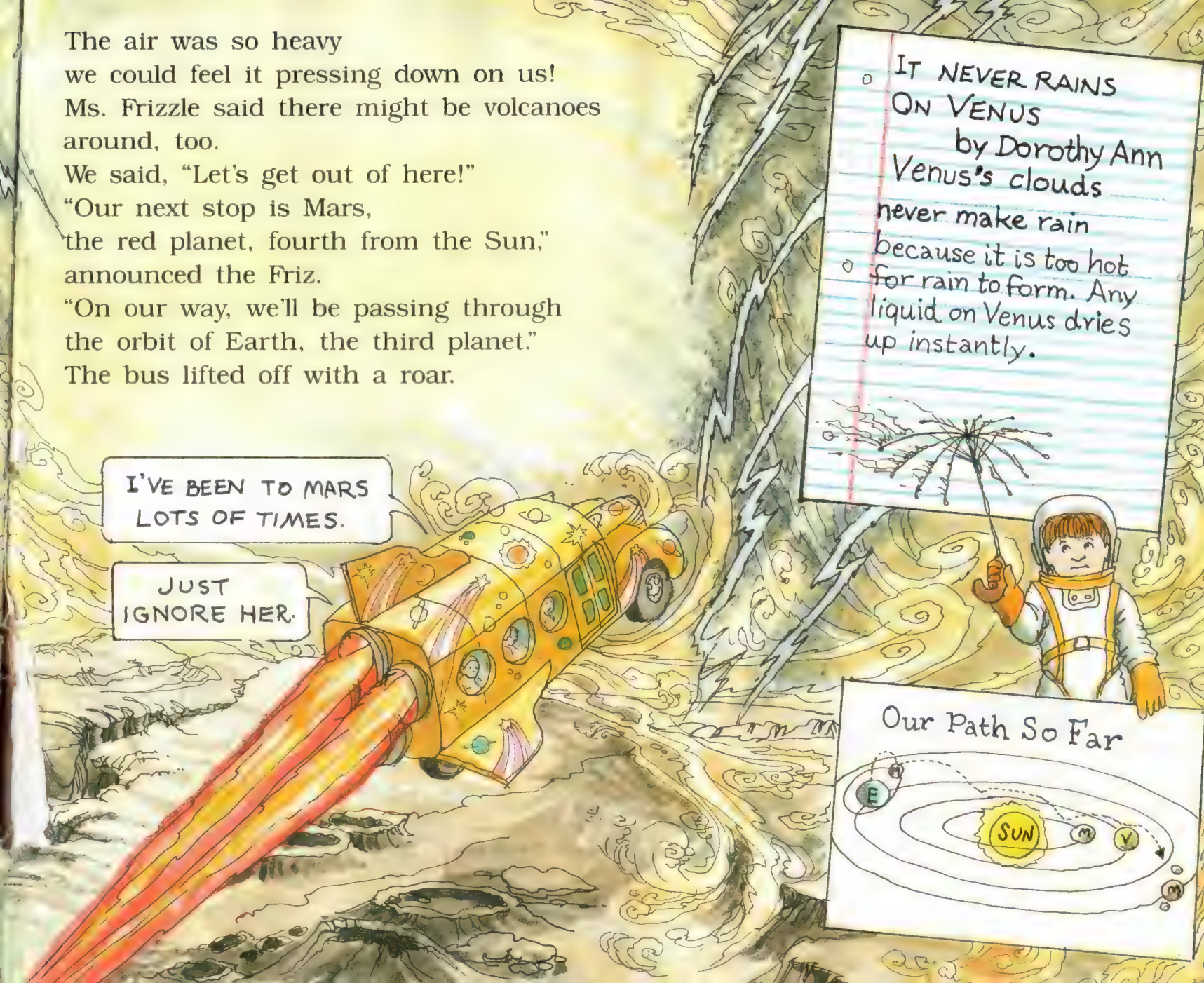
THERE'S NO LIFE ON VENUS, CLASS.

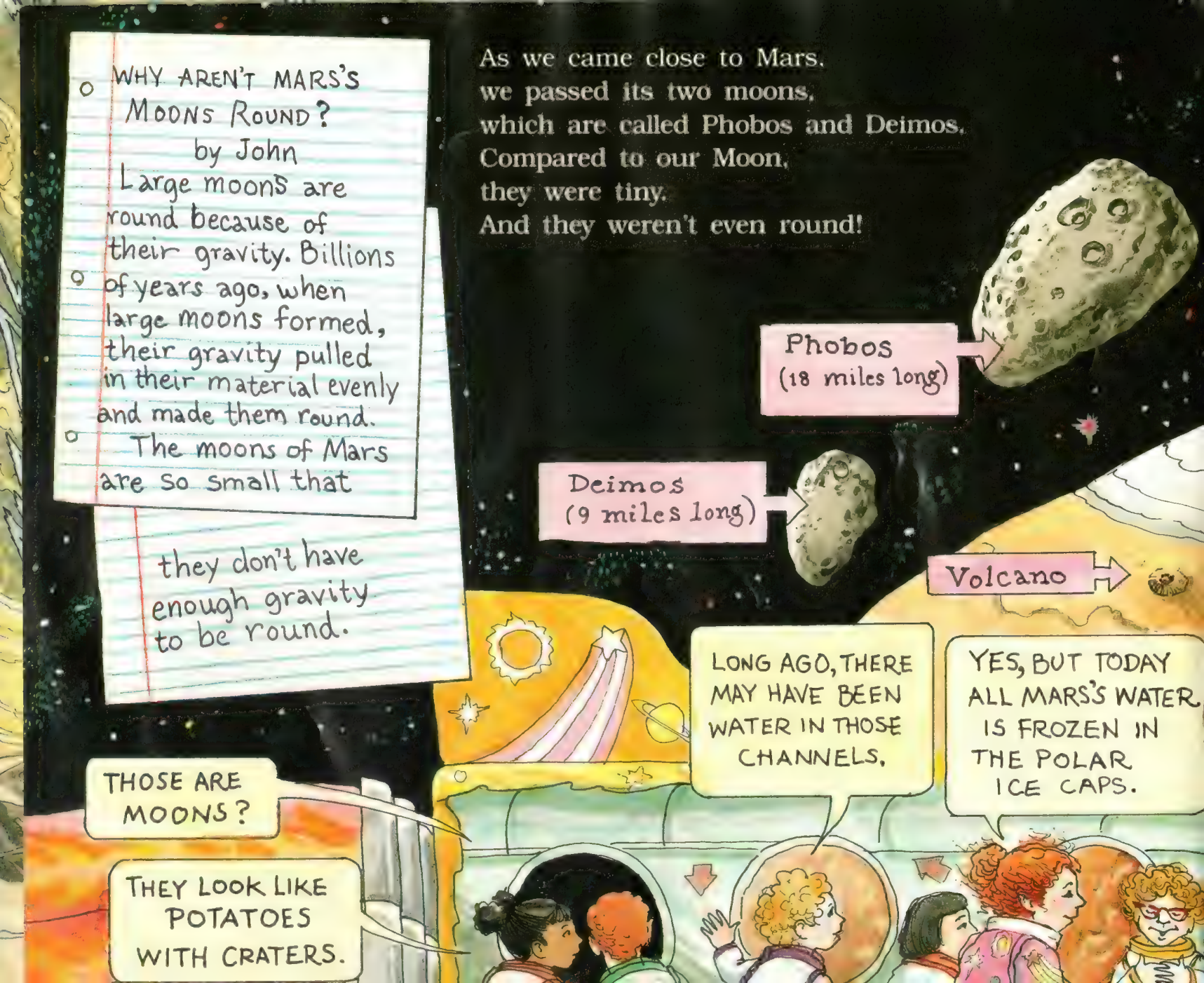
IT'S TOO HOT!

IT'S TOO DRY!

THERE'S TOO MUCH ACID!

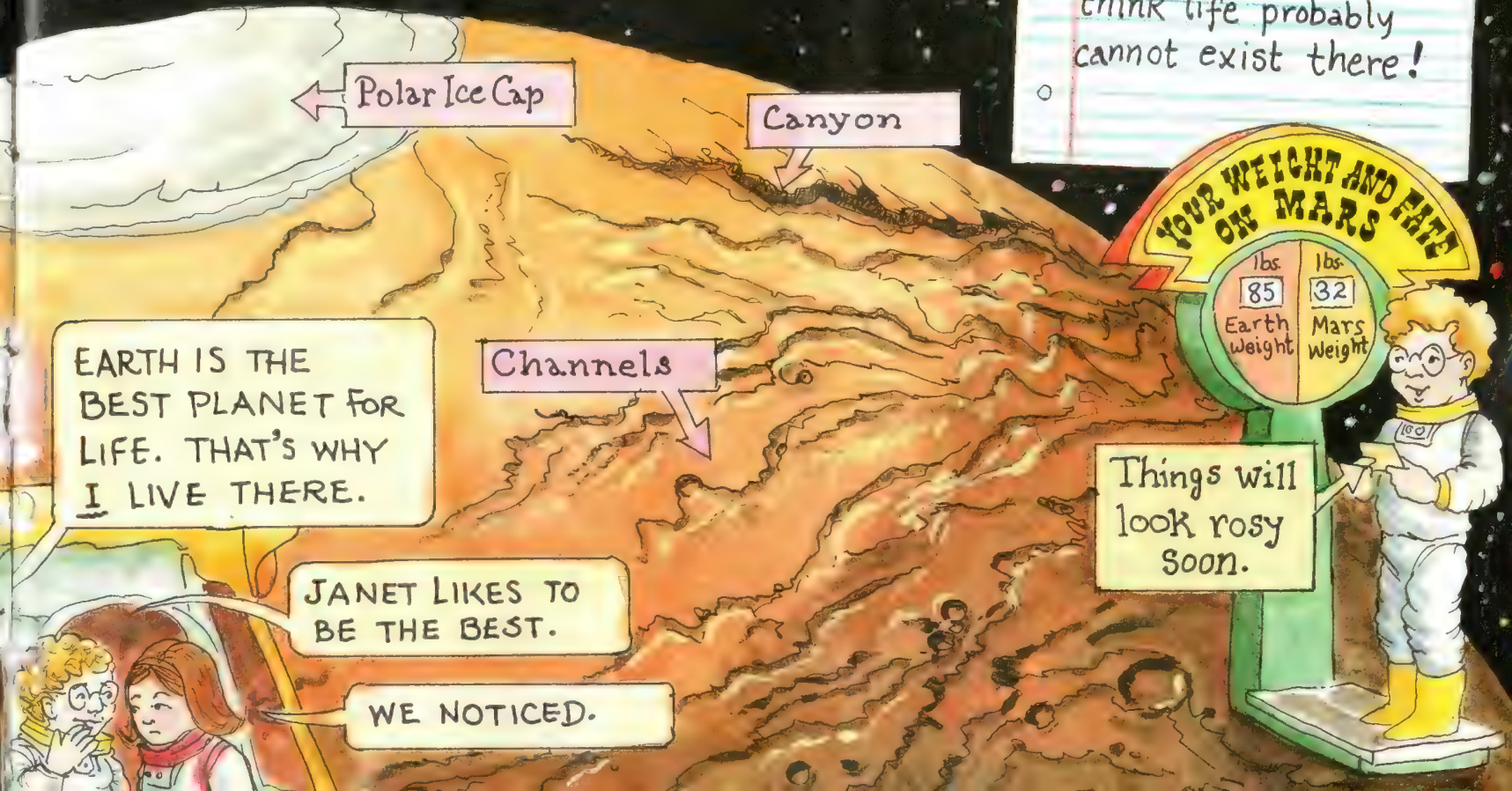
LET'S LEAVE!

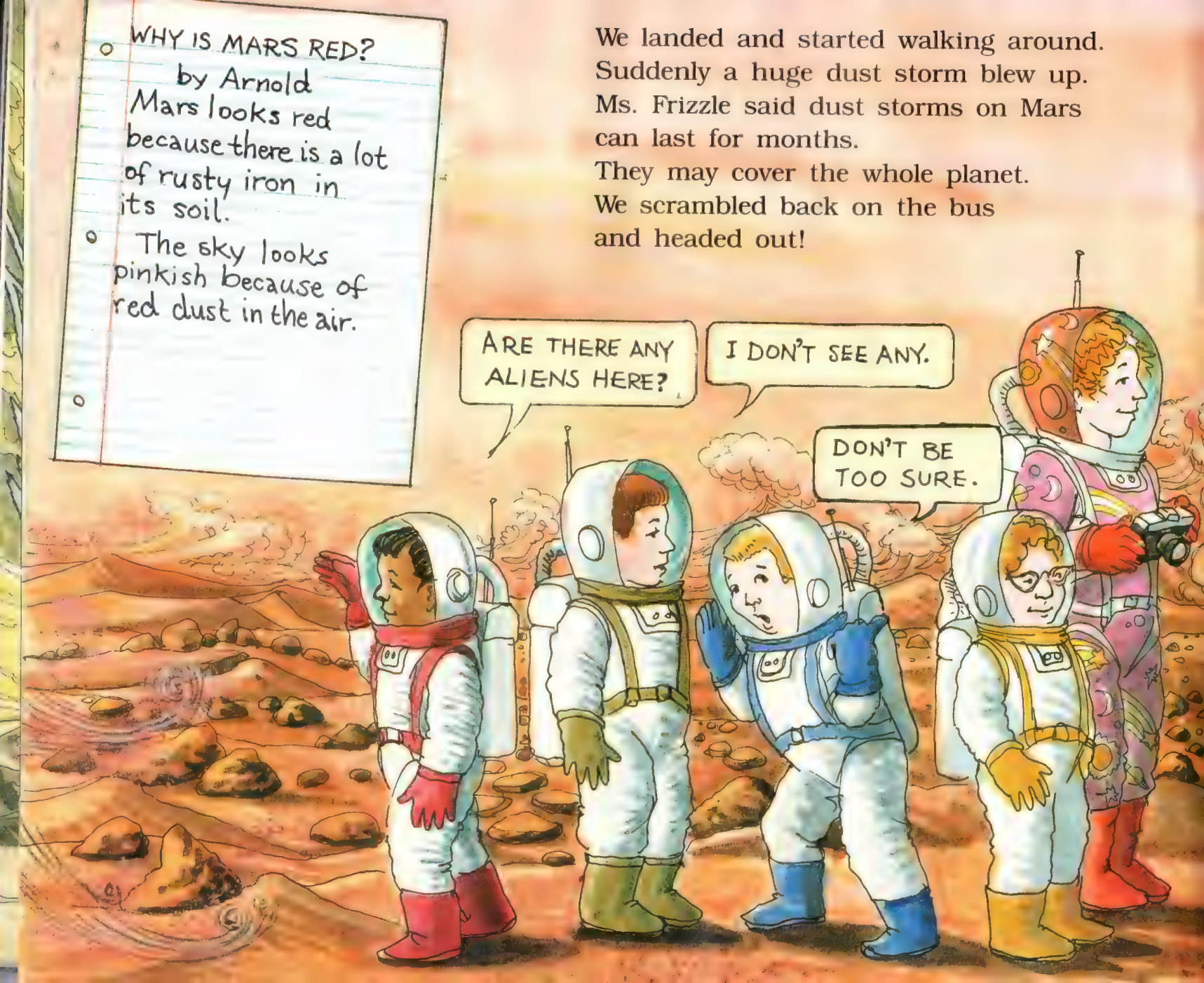

The air was so heavy
we could feel it pressing down on us!
Ms. Frizzle said there might be volcanoes
around, too.
We said, "Let's get out of here!"
"Our next stop is Mars,
the red planet, fourth from the Sun,"
announced the Friz.
"On our way, we'll be passing through
the orbit of Earth, the third planet."
The bus lifted off with a roar.
IT NEVER RAINS ON VENUS
by Dorothy Ann
Venus's clouds never make rain because it is too hot for rain to form. Any liquid on Venus dries up instantly.
I'VE BEEN TO MARS LOTS OF TIMES.
JUST IGNORE HER.
Our Path So Far
E
SUN
M
V
M


WHY AREN'T MARS'S MOONS ROUND?
by John
Large moons are round because of their gravity. Billions of years ago, when large moons formed, their gravity pulled in their material evenly and made them round.
The moons of Mars are so small that they don't have enough gravity to be round.
As we came close to Mars, we passed its two moons, which are called Phobos and Deimos. Compared to our Moon, they were tiny. And they weren't even round!
Phobos (18 miles long)
Deimos (9 miles long)
Volcano
THOSE ARE MOONS?
THEY LOOK LIKE POTATOES WITH CRATERS.
LONG AGO, THERE MAY HAVE BEEN WATER IN THOSE CHANNELS.
YES, BUT TODAY ALL MARS'S WATER IS FROZEN IN THE POLAR ICE CAPS.

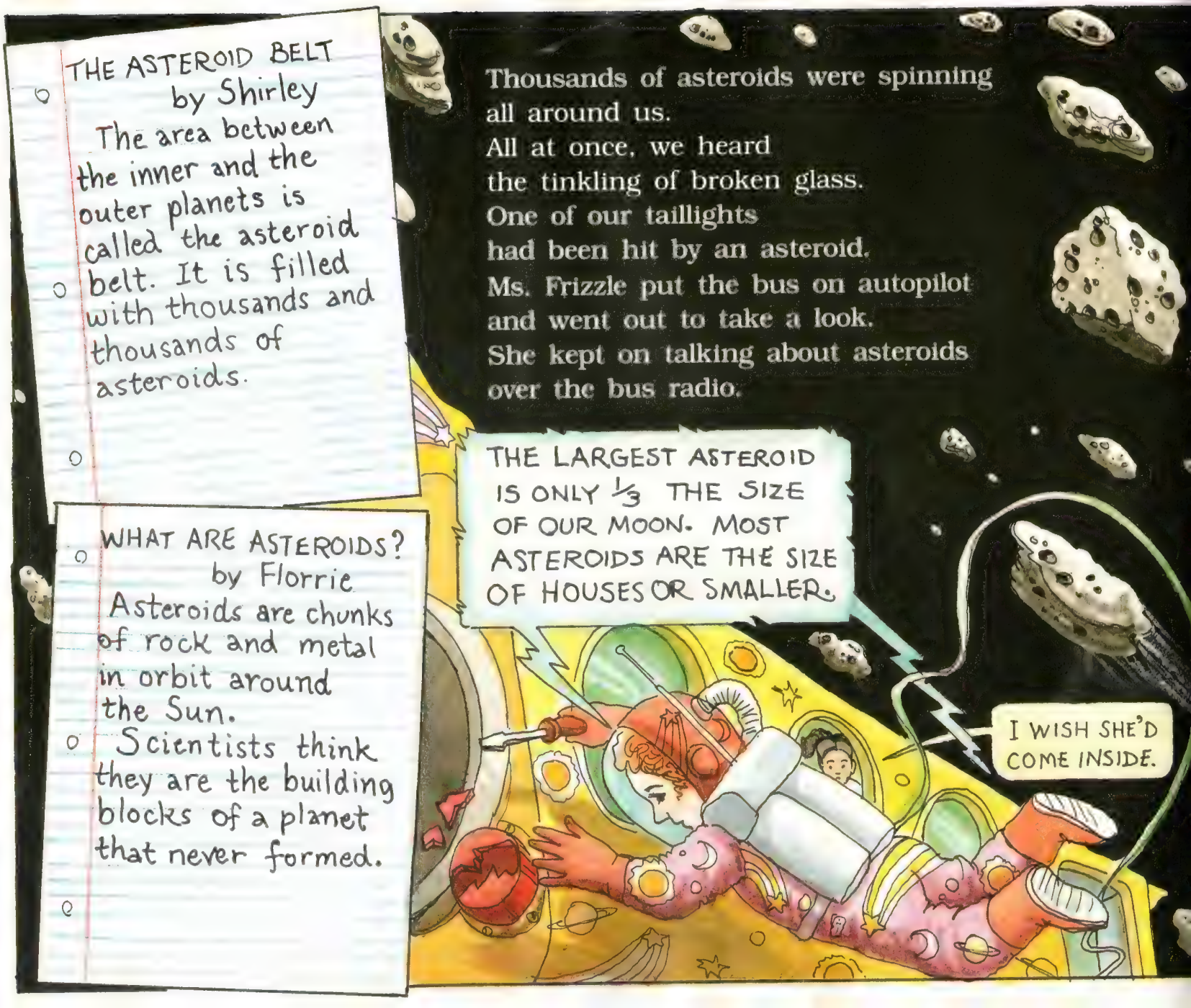
Looking down, we saw a huge canyon.
Ms. Frizzle said it was
as long as the United States.
There was a volcano
three times taller than
the tallest volcano on Earth.
And all around, there were channels
that looked like dried-up river beds.

IS THERE LIFE ON MARS?
by Molly
No life has been found on Mars. Living things need water, and there is no liquid water on Mars.
So space scientists think life probably cannot exist there!

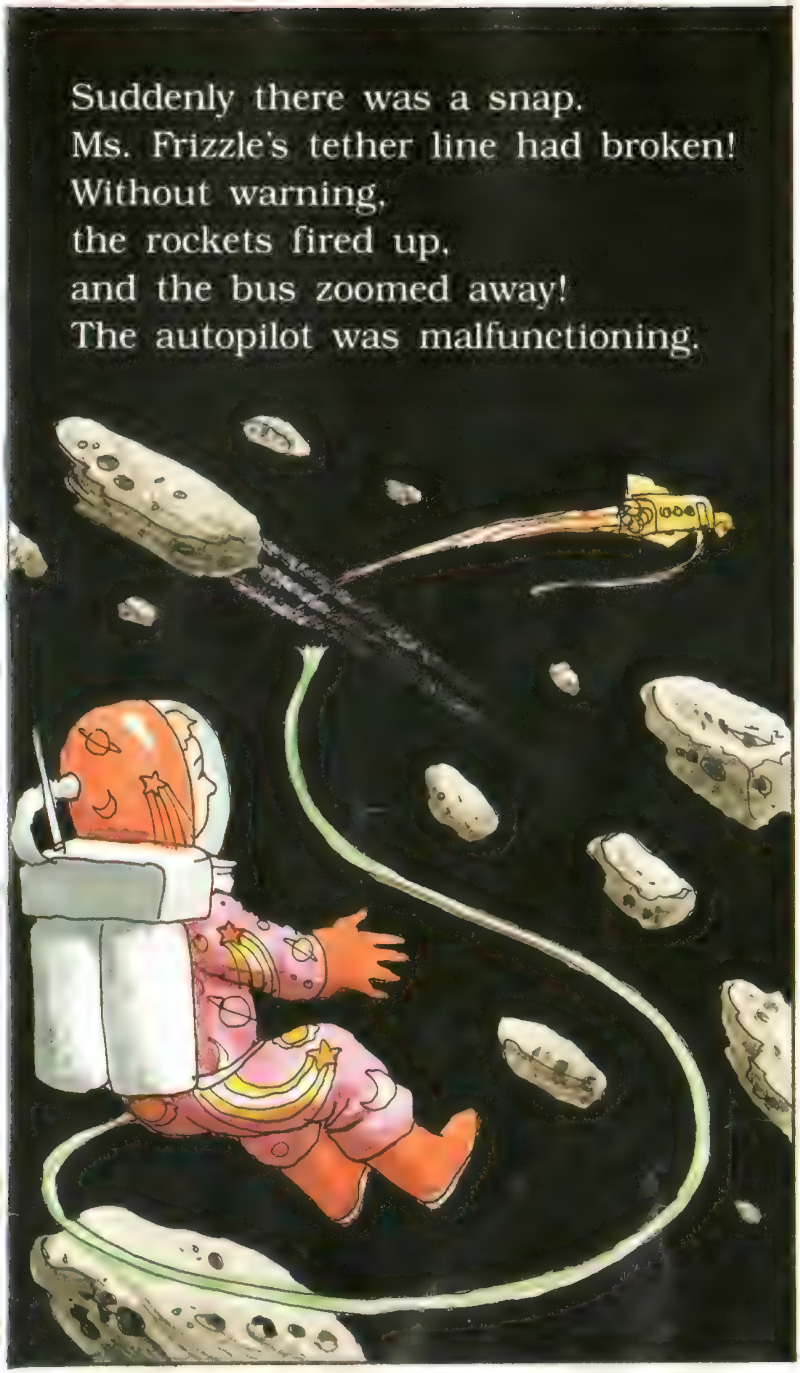



WHY IS MARS RED?
by Arnold
Mars looks red because there is a lot of rusty iron in its soil.
The sky looks pinkish because of red dust in the air.
We landed and started walking around.
Suddenly a huge dust storm blew up.
Ms. Frizzle said dust storms on Mars can last for months.
They may cover the whole planet.
We scrambled back on the bus and headed out!
ARE THERE ANY ALIENS HERE?
I DON'T SEE ANY.
DON'T BE TOO SURE.

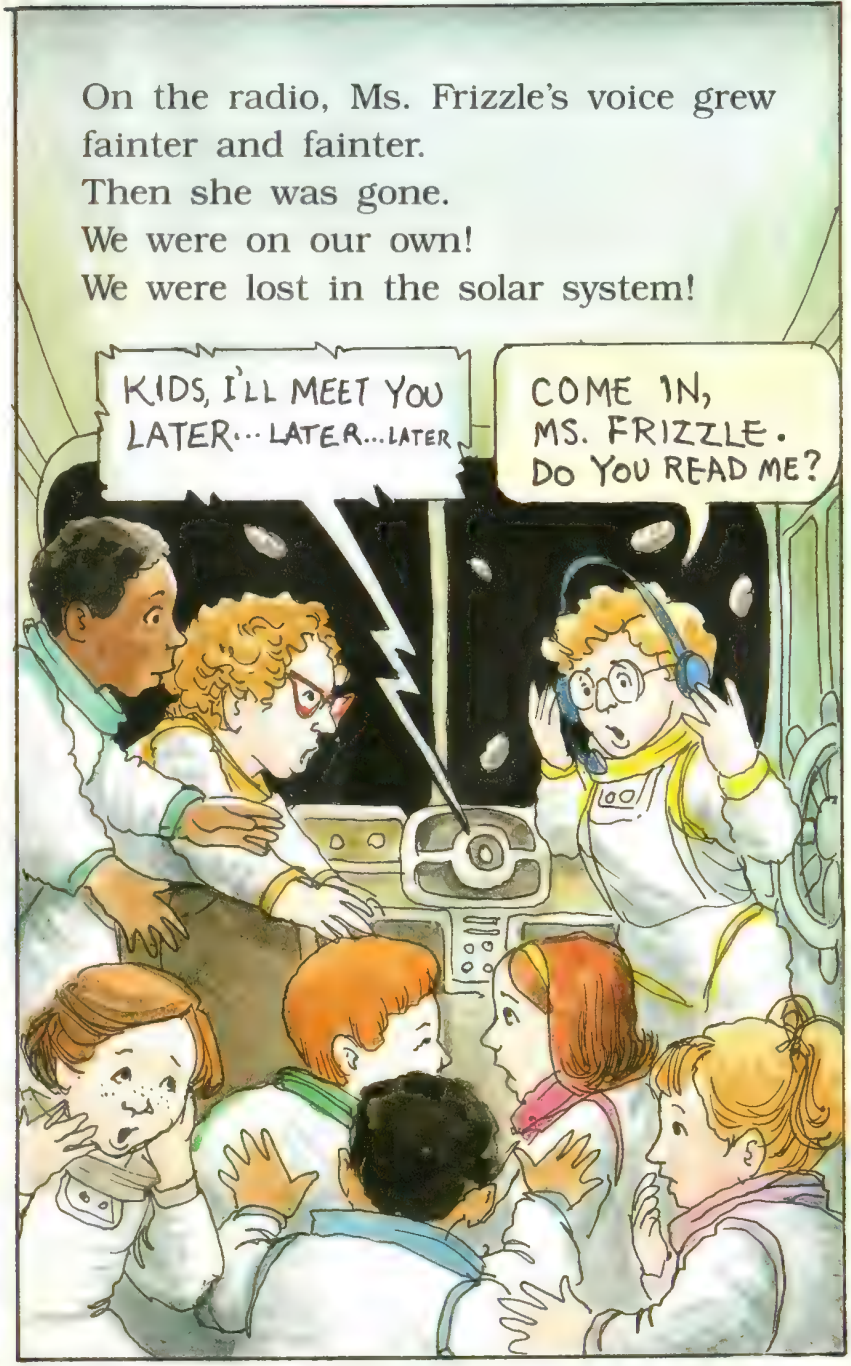
"Mars is the last of what we call
the inner planets!"
Ms. Frizzle shouted above the roar of the rockets.
"We will now be going
through the asteroid belt
to the outer planets!"


THE ASTEROID BELT
by Shirley
The area between the inner and the outer planets is called the asteroid belt. It is filled with thousands and thousands of asteroids.
WHAT ARE ASTEROIDS?
by Florrie
Asteroids are chunks of rock and metal in orbit around the Sun.
Scientists think they are the building blocks of a planet that never formed.
Thousands of asteroids were spinning all around us.
All at once, we heard the tinkling of broken glass.
One of our taillights had been hit by an asteroid.
Ms. Frizzle put the bus on autopilot and went out to take a look.
She kept on talking about asteroids over the bus radio.
THE LARGEST ASTEROID IS ONLY 1/3 THE SIZE OF OUR MOON. MOST ASTEROIDS ARE THE SIZE OF HOUSES OR SMALLER.
I WISH SHE'D COME INSIDE.

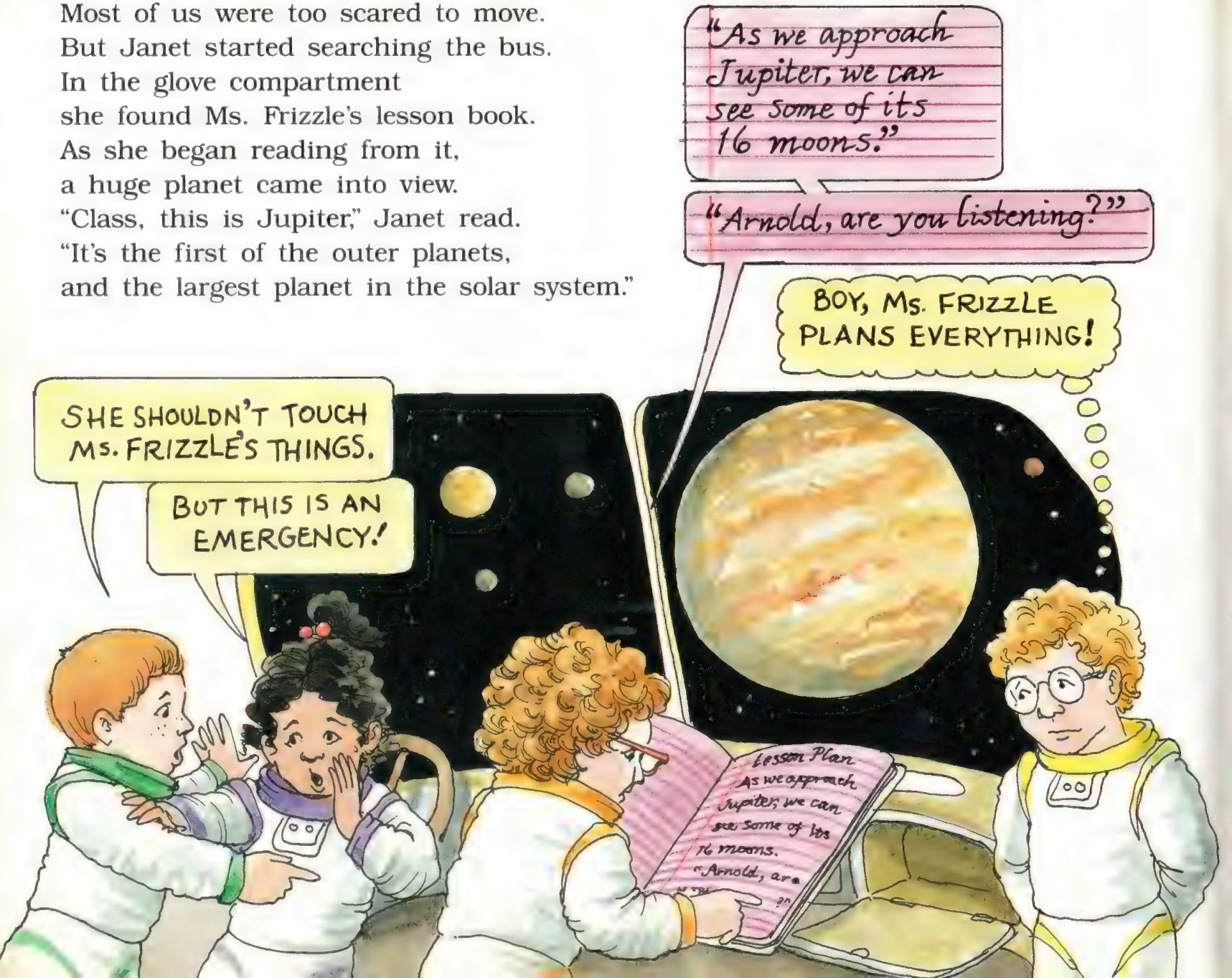
Suddenly there was a snap.
Ms. Frizzle's tether line had broken!
Without warning,
the rockets fired up,
and the bus zoomed away!
The autopilot was malfunctioning.



On the radio, Ms. Frizzle's voice grew fainter and fainter.
Then she was gone.
We were on our own!
We were lost in the solar system!



Most of us were too scared to move.
But Janet started searching the bus.
In the glove compartment
she found Ms. Frizzle's lesson book.
As she began reading from it,
a huge planet came into view.
"Class, this is Jupiter," Janet read.
"It's the first of the outer planets,
and the largest planet in the solar system."

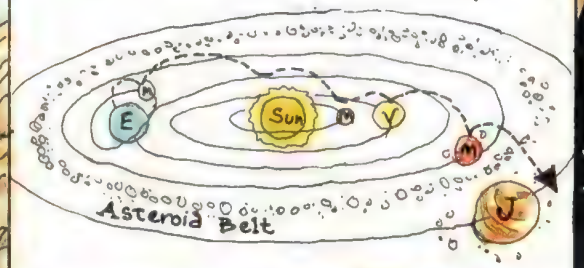


We thought the school bus
was going to land.
But there was no solid ground to land on.
Jupiter is a "gas giant"—
a planet made almost entirely of gas.
As we left Jupiter,
we wondered and worried.
Would we ever get home?

WHAT IS JUPITER'S GREAT RED SPOT?
by Gregory
The Red Spot is probably a huge storm of swirling gas that has lasted for hundreds and hundreds of years.

Great Red Spot

Our Path (Continued)



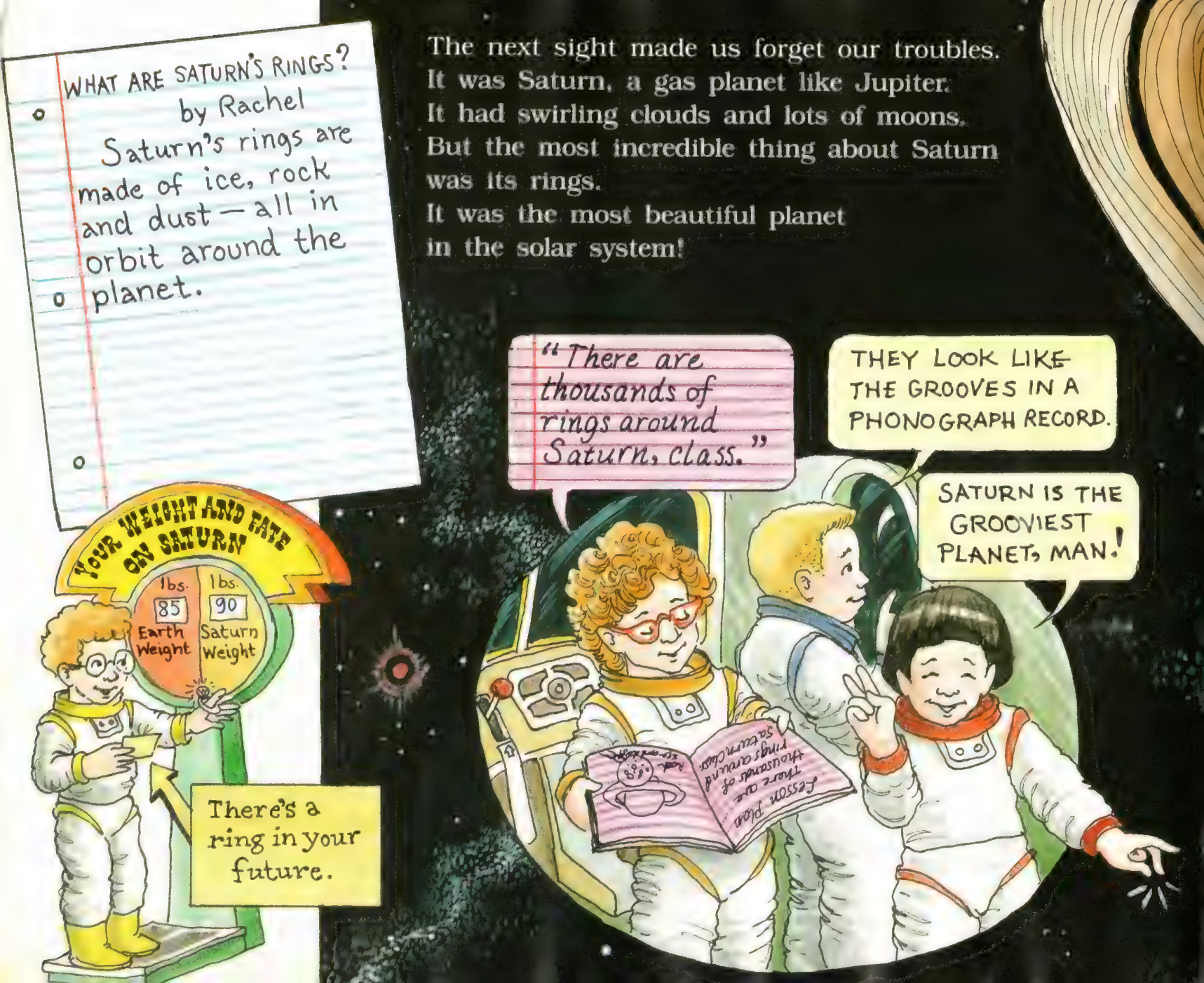
"Jupiter is so big that more than one thousand Earths could fit inside it."

MS. FRIZZLE, WHERE ARE YOU?

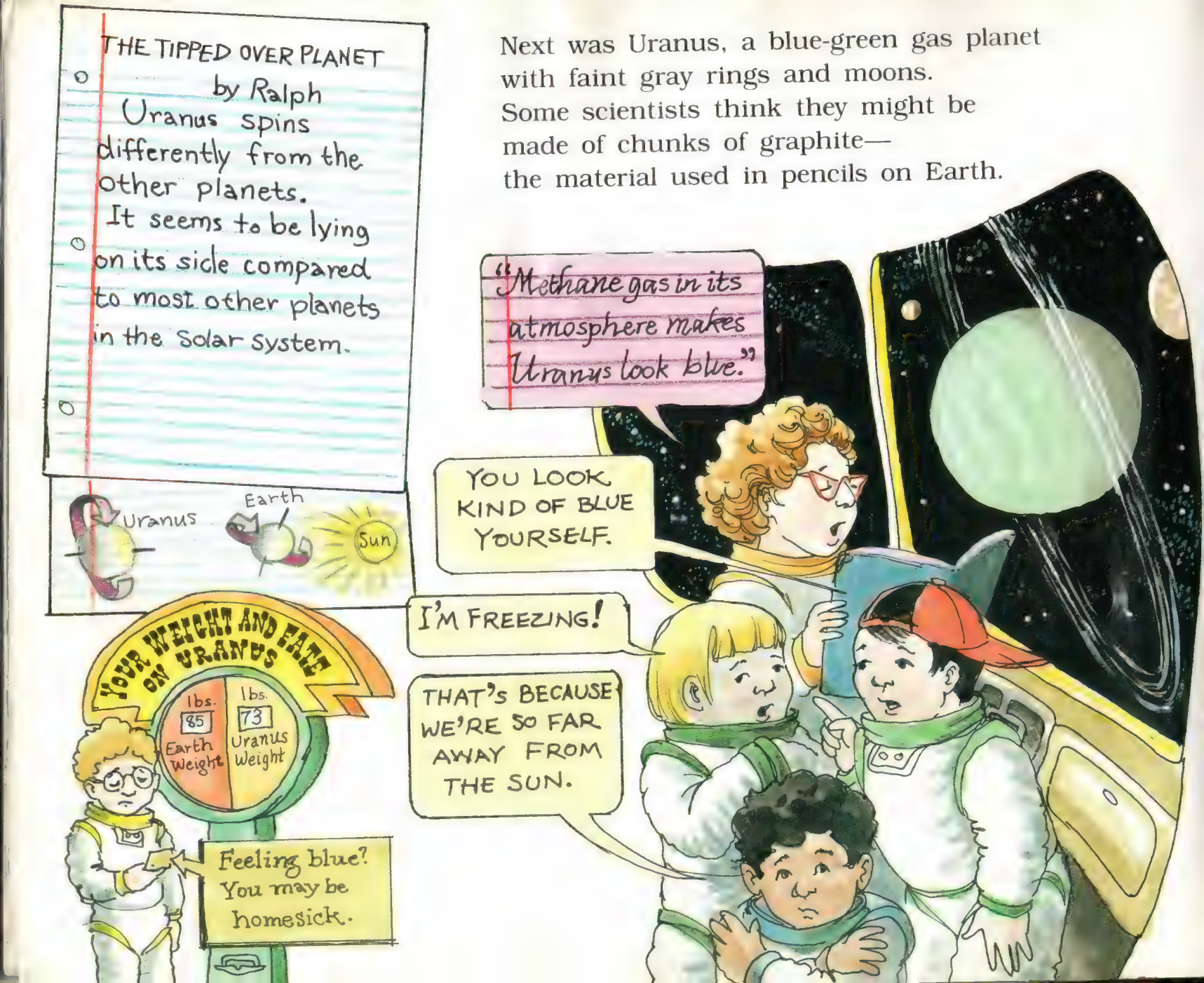
YOUR WEIGHT AND FATE ON JUPITER

lbs.	lbs.
85	247
Earth Weight	Jupiter Weight

Don't worry, you'll lose those extra pounds, Soon!


WHAT ARE SATURN'S RINGS?
by Rachel
Saturn's rings are made of ice, rock and dust — all in orbit around the planet.
The next sight made us forget our troubles. It was Saturn, a gas planet like Jupiter. It had swirling clouds and lots of moons. But the most incredible thing about Saturn was its rings. It was the most beautiful planet in the solar system!
"There are thousands of rings around Saturn, class."
THEY LOOK LIKE THE GROOVES IN A PHONOGRAPH RECORD.
SATURN IS THE GROOVIEST PLANET, MAN!
YOUR WEIGHT AND FATE ON SATURN
lbs.
85
Earth Weight
lbs.
90
Saturn Weight
There's a ring in your future.


THE FLOATING PLANET
by Phoebe
Saturn is made of materials that are lighter than water. If there were a bathtub big enough, Saturn could float in it!
COULD SATURN TAKE A BATH?
YES, BUT IT MIGHT LEAVE A RING!
Rock, ice and dust


THE TIPPED OVER PLANET
by Ralph
Uranus spins differently from the other planets. It seems to be lying on its side compared to most other planets in the Solar System.
Uranus
Earth
Sun
YOUR WEIGHT AND FATE ON URANUS
lbs. 85 Earth Weight
lbs. 73 Uranus Weight
Feeling blue? You may be homesick.
Next was Uranus, a blue-green gas planet with faint gray rings and moons. Some scientists think they might be made of chunks of graphite— the material used in pencils on Earth.
"Methane gas in its atmosphere makes Uranus look blue."
YOU LOOK KIND OF BLUE YOURSELF.
I'M FREEZING!
THAT'S BECAUSE WE'RE SO FAR AWAY FROM THE SUN.

The bus was going faster and faster,
and we couldn't control the autopilot.
We swept past stormy Neptune,
another blue-green planet—eighth from the Sun.
All we could think about
was finding Ms. Frizzle!

HOW LONG IS A YEAR?
by Tim
A year is the time it takes for a planet to go all around the sun. Neptune and Uranus are so far away from the sun that they have very long years.
One year on Uranus is 84 Earth years.
Neptune's year is 165 Earth years.

"Neptune is the last of the giant gas planets."

WE'RE ALMOST OUT OF GAS OURSELVES!

Great Dark Spot

AND THE NEAREST SERVICE STATION IS 4,000 MILLION KILOMETERS AWAY.

YOUR WEIGHT AND FATE ON NEPTUNE

lbs. 85 Earth Weight	lbs. 97 Neptune Weight

You will have a happy birthday 165 years from now.

IS PLUTO A REAL PLANET?
by Wanda
Some scientists think Pluto was once a moon of Neptune. It may have escaped from the orbit around Neptune. Then it became a real planet in orbit around the Sun. Pluto was the last planet discovered in the known Solar system.

We were going so fast,
we almost missed seeing the ninth planet,
tiny Pluto,* and its moon, Charon.
We were so far away from the Sun that it
didn't look big anymore.
It just looked like a very bright star.
We were leaving the solar system.

*Every 248 years, Neptune's orbit is further out than Pluto's. Then Neptune is the ninth planet. But most of the time, Pluto is the ninth planet from the Sun.

THERE'S NOTHING OUT THERE— BUT STARS.

MAYBE THERE'S A TENTH PLANET WAITING TO BE DISCOVERED.

IT'LL HAVE TO WAIT.

I HOPE MS. FRIZZLE IS WAITING, TOO.

YOUR WEIGHT AND FATE ON PLUTO

lbs.	lbs.
85	1½
Earth Weight	Pluto Weight

You will meet a small, dark planet.

CHARON

PLUTO

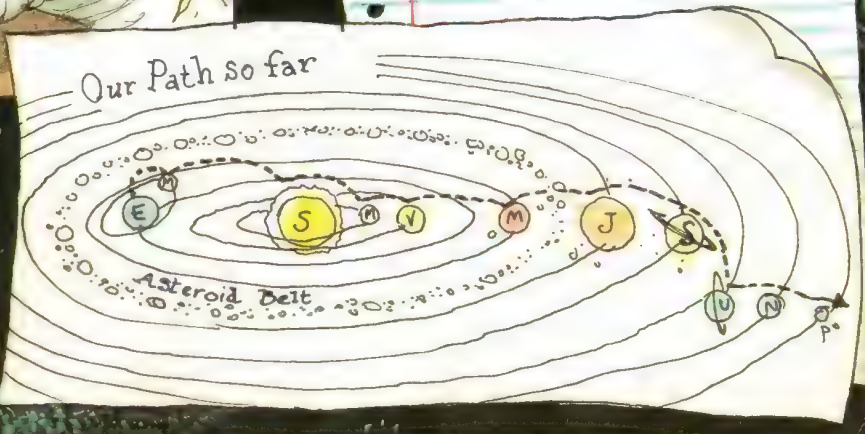
Janet flipped rapidly
through Ms. Frizzle's book.
Suddenly she found something new—
the instructions for the autopilot.
We punched in ASTEROID BELT
on the control panel.
Slowly the bus turned around.
It was working! We were going back!

JANET REALLY SAVED THE DAY.

I TOLD YOU SHE'S A GOOD KID.

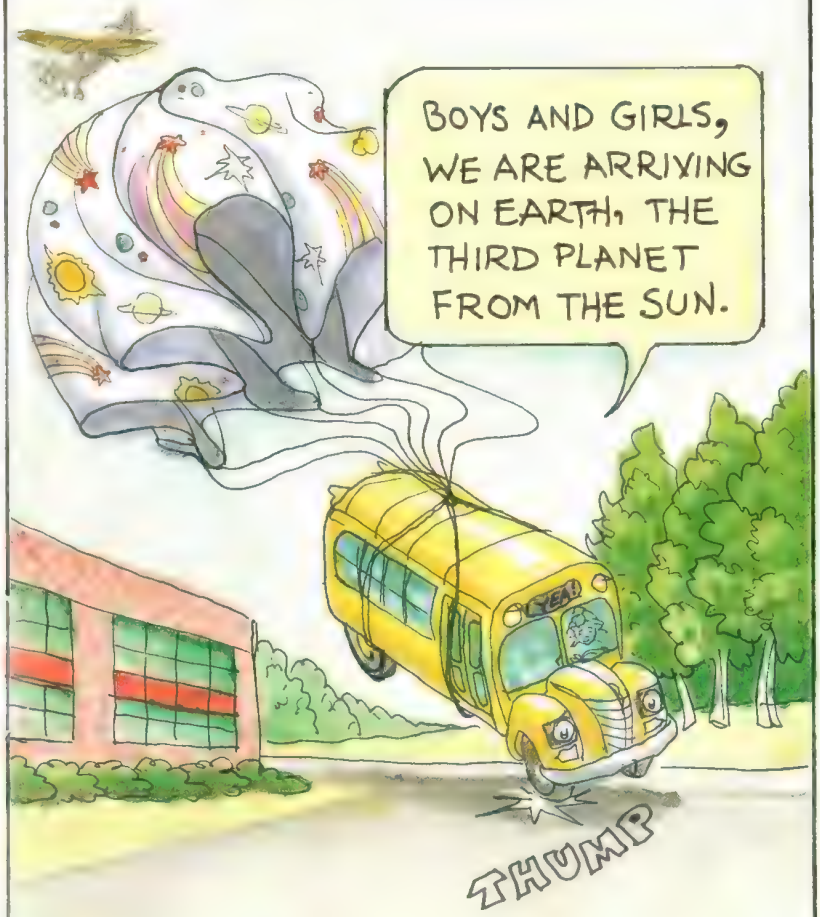
BEYOND PLUTO:
STARS AND MORE STARS
by Alex

Beyond our solar system are billions and billions of stars. There are so many stars and they are so far away that our minds cannot even imagine it. Some of those stars may have planets, and some of those planets could have life on them, just like our earth.




When we reached the asteroid belt, there was Ms. Frizzle!
HEY, THAT ASTEROID IS DRESSED FUNNY.
THAT'S NOT AN ASTEROID, IT'S MS. FRIZZLE!
BOY, AM I GLAD TO SEE HER.
ME TOO!

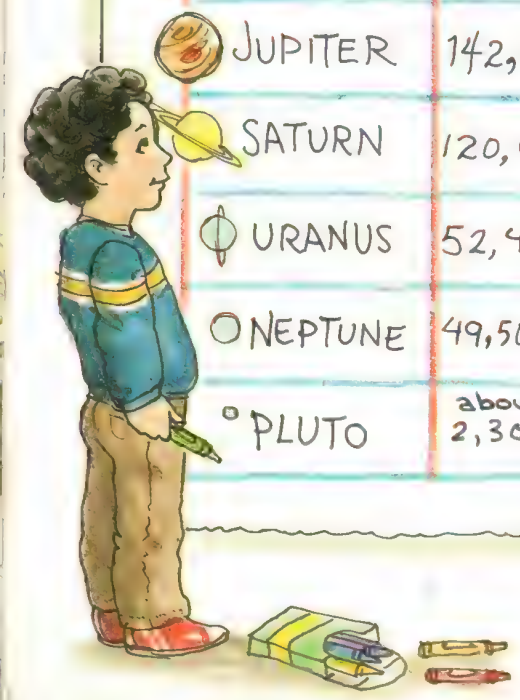
With Frizzie back at the wheel,
the bus headed straight for Earth.
We reentered the atmosphere,
landed with a thump,
and looked around.



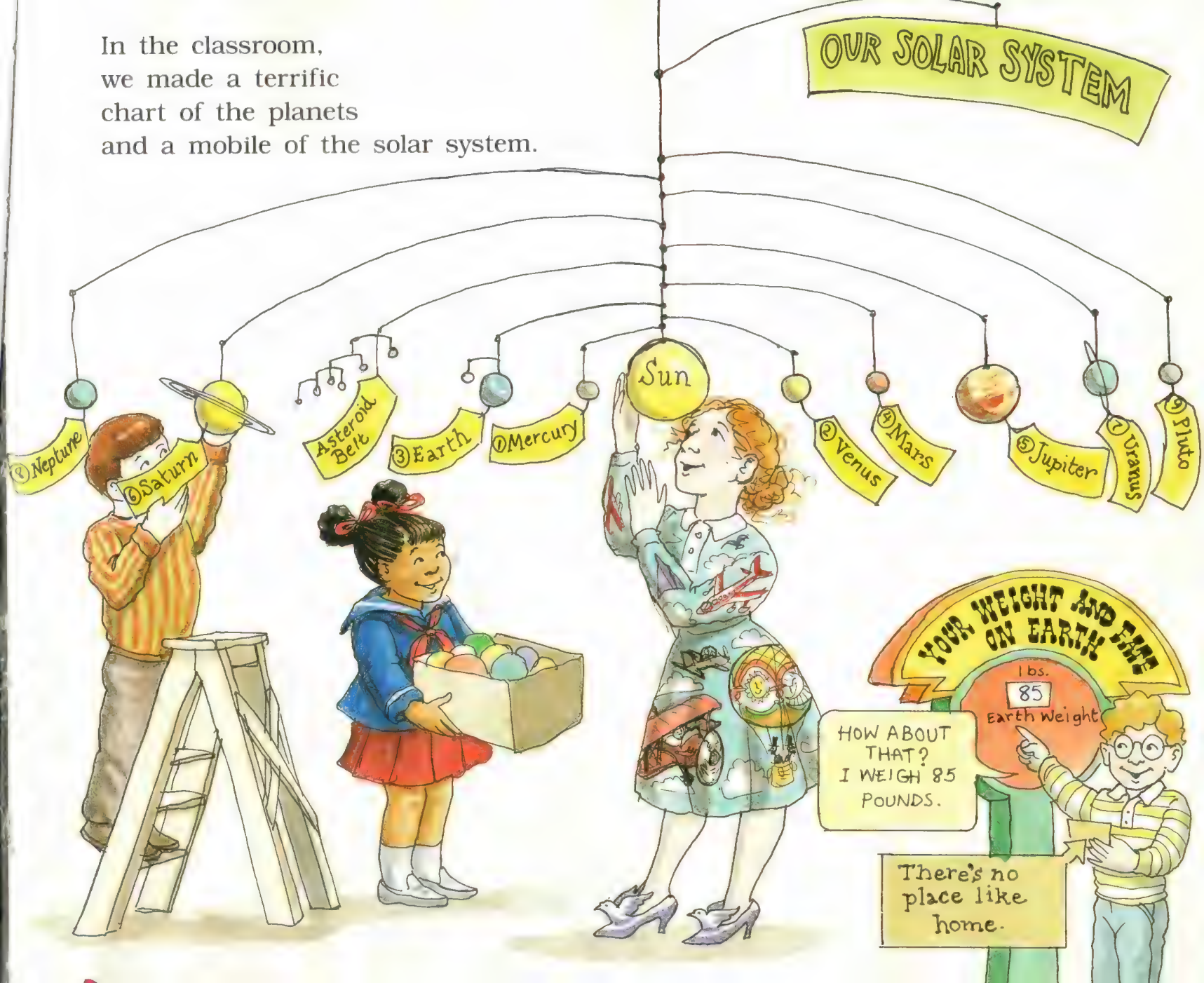
We were in the school parking lot again.
The rockets were gone.
The space suits were gone.
The bus was a wreck.
Everything was back to normal.

OUR PLANET CHART

PLANET	HOW BIG ACROSS	HOW LONG ONE ROTATION (DAY AND NIGHT)	HOW LONG ONE YEAR	HOW FAR FROM THE SUN	HOW MANY MOONS	HOW MANY RINGS
MERCURY	4,900 km.	59 days	88 days	57.9 million km.	None	None
VENUS	12,100 km.	243 days	224.7 days	108.2 million km.	None	None
EARTH	12,756 km.	24 hours	365.3 days	149.6 million Km.	1	None
MARS	6,800 Km.	24.5 hours	687 days	227.8 million Km.	2	None
JUPITER	142,800 Km.	9.8 hours	12 Earth Years	778 million Km.	at least 16	2
SATURN	120,660 km.	10.7 hours	29.5 Earth Years	1,427 million Km.	at least 17	Many
URANUS	52,400 km.	17 hours	84 Earth Years	2,870 million Km.	at least 15	10
NEPTUNE	49,500 Km.	16 hours	165 Earth Years	4,500 million Km.	8	4
PLUTO	about 2,300 km.	6 days	248 Earth years	5,900 million Km.	1	None



In the classroom,
we made a terrific
chart of the planets
and a mobile of the solar system.



At last, it was time to go home.
It had been a typical day
in Ms. Frizzle's class.
Now we had only one problem.
Would anyone ever believe us
when we told about our trip?


WE WENT TO OUTER SPACE TODAY.
OF COURSE YOU DID, DEAR.


MY FAVORITE PLANET WAS JUPITER... NO, MAYBE MARS... OF COURSE SATURN WAS GORGEOUS, TOO...
MOM, MAKE HIM STOP!


AND THERE WAS MS. FRIZZLE, FLOATING AMONG THE ASTEROIDS!
WHAT AN IMAGINATION!
CHECK OUT BOOKS HERE
STARS


WE COULD HAVE BEEN LOST IN SPACE FOREVER.
EAT YOUR SALAD, HONEY.
Daily Buzz
PILOT REPORTS UFO
Says it looked like an old school bus.
Doctors Advise Rest

ATTENTION, READERS!

DO NOT ATTEMPT THIS TRIP ON YOUR OWN SCHOOL BUS!

Three reasons why not:

1. Attaching rockets to your school bus will upset your teacher, the school principal, and your parents. It will not get you into orbit anyway. An ordinary bus cannot travel in outer space, and you cannot become astronauts without years of training.

2. Landing on certain planets may be dangerous to your health. Even astronauts cannot visit Venus (it's too hot), Mercury (it's too close to the Sun), or Jupiter (its gravity would crush human beings). People cannot fly to the Sun, either. Its gravity and heat would be too strong.

3. Space travel could make you miss dinner with your family... for the rest of your childhood. Even if a school bus could go to outer space, it could never travel through the entire solar system in one day. It took years for the Voyager space probes to do that.

ON THE OTHER HAND...

If a red-haired teacher in a funny dress shows up at your school — start packing!

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